Factors Influencing Healthy Eating Habits Among College Students: An Application of the Health Belief Model

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Poor eating habits are an important public health issue that has large health and economic implications. Many food preferences are established early, but because people make more and more independent eating decisions as they move through adolescence, the transition to independent living during the university days is an important event. To study the phenomenon of food selection, the health belief model was applied to predict the likelihood of healthy eating among university students. Structural equation modeling was used to investigate the validity of the health belief model (HBM) among 194 students, followed by gender-based analyses. The data strongly supported the HBM. Social change campaign implications are discussed.

KEYWORDS health belief model, healthy eating, university students

Poor nutrition and obesity are among the most important health issues facing society today, not only in terms of health, but also health care expenses (Goel, 2006; Rashad & Grossman, 2004). There are a variety of predictors of obesity including genetics, physical activity, and food consumption (Goel, 2006). There are other outcomes of food choice and nutrition that also have an independent effect on health including some types of cancer, cardiovascular disease, and diabetes (Nicklas, Baranowski, Baranowski, Cullen,

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Rittenberry, & Olvera, 2001). For these reasons, food selection is an important consumer behavior with many long-term consequences to the individual in the form of health and longevity and to society in the form of health costs.

Some research has shown that the most important factors predicting food selection among adults are: taste, cost, nutrition, convenience, pleasure, and weight control, in that order (Glanz, Basil, Maibach, Goldberg, & Snyder 1998). Many studies have shown that people often establish these tastes and habits while they are relatively young (Birch, 1999). Evidence suggests early establishment of habits and preferences occurs for a variety of behaviors including media use (Basil, 1990) and music listening (Holbrook & Schindler, 1994), as well as food choice (Birch, 1999). Therefore it is advisable to begin establishing good eating habits when people are as young as possible. Importantly, however, for the very young many food decisions are controlled by parents and preschools (Nicklas et al., 2001). Therefore, food choice for the youngest age groups may be constrained by a number of factors.

An especially important time of life for food choice is when people step out independently for the first time and begin to make all of their own food decisions. For many people, this is the transition to college life. The transition to college or university is a critical period for young adults, who are often facing their first opportunity to make their own food decisions (Baker, 1991; Marquis, 2005) and this could have a negative impact on students’ eating behaviors (Marquis, 2005; Rappoport, 2003).

Previous literature has extensively discussed factors that influence eating behaviors among college students. However, application of a behavioral model such as the health belief model (HBM) has received less attention. Only three studies were found that applied HBM in the college eating context (Garcia & Mann, 2003; Von Ah, Ebert, Ngamvitroj, Park, & Kang, 2004; Wdowik, Kendall, Harris, & Auld, 2001). These studies examined avoiding dieting, a combination of eating and exercise, and diabetic students, respectively. The present study provides valuable insights into how health beliefs impact eating behaviors for college students—a population at the crucial stage of transitioning into independent nutritional practices.

EATING BEHAVIOR OF COLLEGE STUDENTS

Numerous studies have shown that college students often have poor eating habits. Students tend to eat fewer fruits and vegetables on a daily basis and report high intake of high-fat, high-calorie foods (Brevard & Ricketts, 1996; Driskell, Kim, & Goebel, 2005; Racette, Deusinger, Strube, Highstein, & Deusinger, 2005). According to the American College Health Association (2006), a 2004 study revealed that only 7.3% of students ate five or more servings of fruits and vegetables daily. The transition to college life often
worsens dietary habits among students (Grace, 1997) which could contribute to weight problems especially during the first year of college or university (Anderson et al., 2003) and continue during later years of life (Centers for Disease Control, 1997; Racette et al., 2005).

Determinants of Eating Behavior

Previous studies have shown a link between demographic and psychographic characteristics with dietary behavior of college students. Driskell et al. (2005) revealed few differences among lower and upper level students in terms of their dietary habits, suggesting that habits established in the first year or two likely carry forward into later college years. However, where a student lives seems to affect his or her dietary habits and diet-related health (Brevard & Ricketts, 1996). Students living off-campus reported a higher percentage of energy from protein. Similarly, serum triglyceride level and the ratio of total cholesterol to high-density lipoprotein were also higher among students living off-campus. The authors conclude that students living off campus are choosing different foods than those living on campus.

Gender differences also exist (Racette et al., 2005). Female college students tend to eat more fatty foods than male students, although their fruit and vegetable consumption tends to remain similar. As discussed earlier, according to Brevard & Ricketts (1996), residence on or off campus made a difference, but it also interacted with gender. Higher energy from protein was more prevalent among men living off campus than on campus. For women, higher serum triglyceride and ratio of total cholesterol to high-density lipoprotein was found among those who lived off campus. Horacek & Betts (1998) clustered male and female college students by dietary intake differences. Four clusters were found: students influenced by internal (hunger and taste) and external cues (friends and media), by budget, by health, and neither of the factors. Males tended to be equally represented in all the four clusters with a somewhat higher percentage in the cues group, while female students tended to cluster in the cues group (55%) followed by health factors (28%). In a study by Mooney & Walbourn (2001), females avoided certain foods for their concern for weight, health and ethical reasons (especially when avoiding meat) more significantly than males. Marquis (2005) similarly reported that females were more significantly motivated by convenience, pleasure, price, and weight concerns than male students. We can thus conclude that the dietary intake of male and female college students is influenced by different factors.

Motives influencing eating behaviors among college students have been studied as well. House, Su, and Levy-Milne (2006) investigated what benefits college students believed result from a healthy diet. In this study, students at a Canadian university reported healthy eating to be helpful in providing a healthy appearance (in terms of weight, skin, physique, and so forth),
providing positive feelings, and preventing disease. Although the results in this study were based on a focus group finding with 15 students (9 students were studying to be dieters) there are nonetheless similarities with studies conducted among general adults (Steptoe, Pollard, & Wardle, 1995). Horacek & Betts (1998) found that taste, time sufficiency, convenience, and budget influenced students’ eating habits in that order. These seem to act more as barriers to healthy eating as revealed from the focus group (House et al., 2006). One could assume that these barriers may be more influential than benefits given the prevalence of eating habits among college students.

Other factors associated with poor eating habits among college students include a higher perception of stress (Cartwright, Wardle, Steggles, Simon, Croker, & Jarvis, 2003), and low self-esteem (Huntsinger & Luecken, 2004). Previous studies have also reported a low level of nutrition knowledge (Barr, 1984; Van den Reek & Keith, 1984). Lack of indepth nutrition knowledge has been attributed to reliance on sources that provide inadequate information on nutrition (Thomsen, Terry, & Amos, 1987).

The Health Belief Model

Although studies have investigated demographic and psychographic characteristics of healthy eating among college students, research is lacking in terms of comparing the effectiveness of these predictors in a single model such as the HBM. The HBM, developed in the 1950s (Rosenstock, 1974), is a expectancy-value model. It has been employed in a variety of public health settings over the years. The HBM postulates that when an individual perceives a threat from a disease (measured by susceptibility to the disease and the severity of disease), and perceived benefits from preventive action exceed barriers then the individual is likely to take preventive action. In the HBM, demographic characteristics and cues to action moderate the effects of the above mentioned predictors.

While three studies were found to apply the HBM to eating among college students, their findings were less useful to the current study because of differences in the nature of the sample or the dependent variables. One study (Wdowik et al., 2001) applied HBM to understand how diabetic students manage their problem and did not address the general student population. The two student groups may differ from each other in their perceptions of healthy diet. For example, the diabetic student population may perceive benefits and barriers of healthy diet differently from general student population. A second study (Garcia & Mann, 2003) employed the model to understand how students resist dieting, not how they approach healthy eating. Finally, a third study (Von et al., 2004) investigated the influence of HBM variables on physical activity and nutrition behavior among other behaviors. Unfortunately, they combined physical and nutrition behaviors as a single measure, although the two behaviors conceptually differ.
The applicability of the HBM has been reported in predicting healthy eating among general adults (for example, Kloeblen & Batisch, 1999; Sapp & Jensen, 1998), especially nutrition behaviors (see Chew, Palmer, & Kim, 1998). However, these findings may be less generalizable to the college student population given the differences between students and the general adult population in terms of lifestyle, income, social environment, and food choices available on the campus. The current study will attempt to extend the HBM's applicability to predicting nutrition behavior among college students.

In the present study, the HBM has been extended in accordance with the Sapp & Jensen (1998) study to include additional variables relevant to the eating behaviors of adults. These variables include perception of current dietary quality, perceived importance of eating a healthy diet, and environmental variables.

Self-Efficacy

Self-efficacy has been added to the model as well. Self-efficacy is the individual's perception that he or she is able to perform the advocated behavior (Bandura, 1977). Self-efficacy has been shown to impact behavior in several consumer behavior contexts such as response to fear appeals (Witte, 1992) and charitable donations (Basil & Ridgway, 2002). Self-efficacy has played an important role in predicting nutrition behavior among college students as well (Garcia & Mann, 2003; Von Ah et al., 2004).

The central purpose of this study was to test the predictive ability of the HBM on the likelihood of eating healthy in the next two-week period among college students. As discussed earlier, since dietary behavior and motives differ by gender, we also intend to test HBM independently for male and female college students. The period of two weeks was chosen in an effort to assure that subjects would be able to remember their eating habits. Healthy eating was defined as “Eating a diet that is low in bad fat, sodium, bad cholesterol and sugar and, high in fiber, fresh fruits and vegetables.”

HBM as modified for an eating context was hypothesized to predict college students’ intentions to eat a healthy diet. Based on the above discussion, we propose the following hypotheses:

H1: The importance of eating healthy will be positively influenced by dietary status, perceived severity, perceived susceptibility, and cues.
H2: The importance of eating healthy will show a negative relationship with barriers.
H3: The importance of eating healthy will show a positive relationship with eating intentions.
H4: Food features will positively influence barriers.
H5: Food features will negatively influence benefits.
H6: Food features will positively influence efficacy.
**METHOD**

Students were recruited at a Canadian university. The study was conducted by advertising $5 for those who were willing to participate in a 20-minute survey. The final convenience sample consisted of 194 Canadian university undergraduate students. The gender distribution was 45% female and 55% male ($n = 88$ and 106 respectively). Respondents were predominantly in the 18–25 year old range, representing 84% of the sample ($n = 162$), predominantly Caucasian (75% of the sample, $n = 146$) followed by Asians (20% of the sample, $n = 38$), and predominantly earning less than $24,000 (68% of the sample, $n = 133$). Responses to height and weight questions were used to calculate each respondent’s body mass index (BMI). The average BMI was 23 (for reference, a BMI of 25 or more indicates an overweight person).

This research was part of a larger study containing an experiment that manipulated participants’ hypothetical health conditions and asked them to make food product choices. The effects of the experimental manipulations

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FIGURE 1 Model predicting likelihood of eating healthy.

H7: Barriers will negatively influence efficacy.
H8: Barriers will negatively influence behavior intention.
H9: Benefits will positively influence behavior intention.
H10: Self-efficacy will positively influence behavior intention.

See Figure 1 for a depiction of the modified HBM.
were controlled while calculating the effect of HBM variables for the present analysis to assure that they did not impact the results.

Procedure

The study was first approved by the university’s Human Subjects Committee. Respondents were invited to a computer lab where they first took part in the manipulated health concern portion of the research. They then completed the HBM survey which is the focus of the present analysis. After completing the study they were given $5 as promised compensation and a feedback sheet informing them of the purpose of the study.

Independent Measures

All items were measured with a 7-point bipolar scale (−3 to 3) unless otherwise noted. Questions for most variables were derived from Sapp & Jensen’s (1998) study. The ‘dietary status’ variable was measured with four questions (In your opinion, was your diet in the previous two-week period lower or higher in nutrition or was it just about right compared with Health Canada’s recommended dietary guidelines? How healthy have your food choices been in the last two weeks: Every meal/Never? In the course of the previous two-week period, how often have you made good food choices? In the course of the previous two-week period, how often have you made good food choices: Never/Always?). These items produced an alpha of 0.80.

Perceived severity was measured using seven items (I will miss more than two months of school or work; I will have long-lasting effects; I will be bed-ridden for a long time, I will have medical expenses; I will harm my career; My social relationships will suffer; I will hurt my family life) producing an alpha of .86. Perceived susceptibility was a single item measure (Do you think some day you will get seriously ill if you do not make good food choices?). The cues to action variable was measured with three items (I would pay more attention to the quality of my food choices if I read information in the mass media (news stories, ads, other programs); I would pay more attention to my food choices if recommended by a doctor; I would pay more attention to my food choices if friends or family members suggested it) producing an alpha of .66. Importance of eating a healthy diet was measured with two items (How important is it to you to eat a diet high in nutrition? How important is nutrition to you when you shop for food?) producing an alpha of .80 ($r = .67$).

The food features variable was measured with four constructs: price, taste, ease of preparation, and convenience (price; taste; ease of preparation; convenience is important to me when I shop for food) producing an alpha of 0.61. Benefits of healthy eating was measured with five items (For me to eat a
nutritious diet most of the time in the next two-week period would be harmful/beneficial; unpleasant/pleasant; bad/good; worthless/valuable; unenjoyable/enjoyable) producing an alpha of .84. Barriers to healthy eating was measured with three items (I don’t like the taste of most foods that are high in nutrition; I think it would take too much time to change my diet most of the time in the next two-week period to include more foods high in nutrition; Over the next two weeks, I think it would be too hard to change my diet to include more foods high in nutrition) producing an alpha of .79. Efficacy to healthy eating was measured with two items (If I tried, I am confident that I could maintain a diet high in nutrition most of the time in the next two-week period; If I wanted to, I feel that I would be able to follow a diet high in nutrition most of the time in the next two-week period) producing an alpha of .88 (r = .80).

Dependent Measure

Likelihood of eating healthy’ was measured with three items, each measured on a seven-point scale: (a) I intend to eat a nutritious diet most of the time in the next two-weeks, Extremely Unlikely/Extremely Likely; (b) In the course of the next two-week period, how often will you make good food choices? Never/Every Meal; (c) In the course of the next two-week period, how often will you make good food choices? Never/Always] producing an alpha of .82.

Discriminant validity analysis was conducted to check for the extent to which a construct was truly distinct from other constructs. Pearson correlations between independent variables were observed. None of the correlation scores were strong enough (maximum r = .52, p < .01) to warrant a merging or dropping of constructs. Finally, to test for common method bias arising out of having a single source of information from students, we conducted Harman’s (1976) single-factor test (EFA) selecting varimax rotation and principle components method with all the items across constructs. The results revealed several factors with eigenvalues more than 1. We thus concluded that there are many constructs available and that the items are measuring distinct constructs, and found no evidence of a significant common method bias.

RESULTS AND ANALYSIS

A Pearson correlation analysis was conducted with the independent and the dependent variables. The correlation scores ranged from −.60 to .62. Later, a structural equation model was constructed to test the modified HBM among all three samples (all, male, and female students) using AMOS 5.0. As mentioned earlier, the effect of the experimental manipulations were controlled in order to get a better understanding of the effect of the modified HBM variables. All subjects participated in the experimental study and were
assigned to one of the health concern manipulations (diabetes, heart disease, and generally good health). The control variable was allowed to covary with every independent variable and a regression path on every dependent variable among all three samples. The influence of the control variable largely lacked significance. In the all student sample, the variable had a significant influence on the likelihood to eat healthy, and had a significant covariance with the adequacy of current diet variable. There was no significant relationship of the control variable in the female student sample. In the male student sample, the control variable had significant covariance only with adequacy of current diet and the severity construct. In order to reduce the clutter, paths of the control variable are not shown in the figures.

Total Sample
The HBM for the all students sample was identified given the good fit indices (N = 194, CFI = .99, RMSEA = .05). The four independent variables, dietary status (M = 4.41, SD = 1.11, B = 0.44, p < .01), perceived severity (M = 4.85, SD = 1.22, B = 0.17, p < .01), perceived susceptibility (M = 5.18, SD = 1.56, B = 0.16, p < .01), and cues (M = 5.22, SD = 1.12, B = 0.22, p < .01) significantly predicted the importance of eating a healthy diet. In turn, the importance variable (M = 5.42, SD = 1.16) predicted barriers to eating healthy (B = −0.39, p < .01) and likelihood to eat healthy with the regression weight of 0.57 (p < .01). Food features (M = 5.53, SD = 0.90) had a significant influence on barriers (B = 0.15, p < .05) and benefits (B = −0.14, p < .05) but no influence on efficacy (B = 0.09, n. s.). In turn, barriers (M = 3.35, SD = 1.50) had a significant influence on likelihood to eating healthy (B = −0.14, p < .05), while benefits (M = 5.98, SD = 0.91) did not (B = 0.05, n. s.). Barriers had a strong influence on efficacy (B = −0.74, p < .01). In turn, efficacy (M = 5.58, SD = 1.30) had a significant influence on the likelihood variable (M = 5.28, SD = 1.10, B = 0.25, p < .01). Based on these results, we conclude that the data supported all hypotheses except for H6 and H9. See Figure 2.

Female Sample
The HBM model was later tested for each gender. The HBM for the female students sample was identified given the good fit indices (N = 88, CFI = .98, RMSEA = .07). As expected, the model was supported by the data. The three independent variables, dietary status (M = 4.55, SD = 1.15, B = 0.52, p < .01), perceived severity (M = 4.77, SD = 1.25, B = 0.27, p < .01), and cues (M = 5.41, SD = 1.14, B = 0.17, p < .05) significantly predicted the importance of eating a healthy diet. But the influence of perceived susceptibility (M = 5.27, SD = 1.54) on importance of eating a healthy diet was not significant (B = 0.10, n. s.). In turn, the importance variable (M = 5.64, SD = 1.15) predicted barriers to eating healthy (B = −0.73, p < .01) and the likelihood
to eat healthy with the regression weight of 0.82 (p < .01). Food features (M = 5.59, SD = 1.01) did not have a significant influence on barriers (B = 0.15, n. s.), nor on efficacy (B = 0.02, n. s.) but a significant influence on benefits (B = -0.25, p < .01). In turn, barriers (M = 3.28, SD = 1.62) had a significant influence on likelihood to eating healthy (B = -0.46, p < 0.1), while benefits (M = 6.15, SD = 0.84) did not (B = -0.31, n. s.). Barriers had a strong influence on efficacy (B = -0.55, p < .01). In turn, efficacy (M = 5.73, SD = 1.19) had a significant influence on the likelihood variable (B = 0.33, p < .05). See Figure 3.

Male Sample
The HBM for the male students sample was identified with good fit indices (N = 106, CFI = .97, RMSEA = .06). As expected, the model was supported by the data. The three independent variables, dietary status (M = 4.30, SD = 1.07, B = 0.37, p < .01), perceived susceptibility (M = 5.09, SD = 1.57, B = 0.23, p < .01), and cues (M = 5.06, SD = 1.10, B = 0.16, p < .05) significantly predicted the importance of eating a healthy diet. But perceived

**FIGURE 2** Model predicting likelihood of eating healthy (all students).
severity \( (M = 4.93, SD = 1.20) \) failed to significantly influence the importance variable \( (B = 0.12, \text{ n. s.}) \). In turn, the importance variable \( (M = 5.25, SD = 1.14) \) significantly predicted barriers \( (B = -0.30, p < .01) \) and the likelihood to eating healthy with the regression weight of 0.45 \( (p < .05) \). Food features \( (M = 5.47, SD = 0.79) \) did not statistically influence barriers \( (B = 0.07, \text{ n. s.}) \), efficacy \( (B = 0.14, \text{ n. s.}) \), and benefits \( (B = 9.71, \text{ n. s.}) \). Similarly, barriers \( (M = 3.41, SD = 1.39, B = -0.04, \text{ n. s.}) \) and benefits \( (M = 5.85, SD = 0.94, B = -0.01, \text{ n. s.}) \) did not statistically influence likelihood to eating healthy. However, barriers had a strong influence on efficacy \( (B = -1.31, p < .01) \). In turn, efficacy \( (M = 5.45, SD = 1.38) \) had a significant influence on the likelihood variable \( (B = 0.39, p < .01) \) (See Figure 4). Comparing the chi-square value and support for the hypotheses for the male and female samples, it seems the model fits the female group data slightly better (Chi-Sq. for females = 18.89, Chi-Sq. for males = 23.94) despite a smaller sample size (Females = 88, Males = 106).

In addition, one-way ANOVA was conducted to compare the means of the HBM variables by gender. Females had a higher intention \( (M = 5.52, SD = 1.06) \) to intake a nutritious diet than males \( (M = 5.08, SD = 1.09, F = 7.80, p < .01) \). Among independent variables, females similarly reported higher means than males among all variables except for severity and barriers. However, there was a statistical difference only among three variables.

**FIGURE 3** Model predicting likelihood of eating healthy (female students).
Females reported statistically higher means for cues to action (M diff. = 0.34, F = 4.54, p < .05), importance of eating a healthy diet (M diff. = 0.39, F = 5.50, p < .05) and benefits from a healthy diet (M diff. = 0.30, F = 5.43, p < .05).

To summarize, for females, the intention to consume a healthy diet is indirectly influenced by dietary status, severity, and cues through their effect on importance of a healthy diet. The importance of a healthy diet also influences behavior intention through its influence on barriers. Food features influence benefits, but benefits failed to influence behavior, while barriers influence behavior directly as well as via its effect on efficacy. For males, the intention to consume a healthy diet is indirectly influenced by dietary status, susceptibility, and cues through their effect on importance of a healthy diet, by importance through its effect on barriers, and by barriers through its effect on efficacy.

In general, the relationship of dietary status and cues on behavior intention via importance of a healthy diet, the relationship of importance with behavior intention through its relationship with barriers, and the relationship of barriers with behavior intention via the influence of efficacy seem to hold true among both males and females. Similarly, food features failed to predict barriers and benefits failed to predict behavior intention.
among both the samples. But males and females differed on other variables. The severity construct among males and susceptibility among females failed to influence importance of eating a healthy diet. Food features of price, taste, ease of preparation, and convenience while shopping for healthy food negatively influenced benefits among females, but not among males.

Finally, barriers significantly and negatively influenced behavior intention among females but not among males. The barriers construct included two important items of taste and time sufficiency. As Marquis (2005) suggested, these issues matter to females.

DISCUSSION

Summary of Findings

These results make an important contribution to our understanding of student health behavior. Previous research is extended by incorporating important additional variables into the HBM. This research focused on an important population which is at a key crossroads in nutritional health. The HBM was helpful in predicting the variance in likelihood of healthy eating. Since eating behaviors and reasons for eating vary by gender (Dutta-Bergman, 2005), we also investigated how these factors varied by gender. The results of this study demonstrate potential mechanisms by which these gender differences occur. In a study conducted among the general population, Kristal, Hedderson, Patterson, & Neuhauser (2001) argue that efforts need to target men. Since male students reported a lower intention to consume a healthy diet than did females, our research supports this contention.

Our findings were similar to other college studies in terms of influence of variables such as perceived severity (Mooney & Walbourn, 2001), and efficacy to eat healthy (Garcia & Mann, 1993; Von Ah et al., 2004). Some findings bear a close resemblance with the Sapp & Jensen (1998) study conducted with the general population. The influence of gender, dietary status, importance of a healthy diet, food features, and cues to action on the intention to eat healthy in our study was similar to their study. Despite similarities with earlier research this study found no significant effects of the food features such as price, taste, ease of preparation, and convenience on barriers, efficacy, and thus the likelihood to eat a healthy diet. Although the mean was strongly positive (M = 5.53 among all student sample), the food features variable did not have a significant influence. Given the student lifestyle (Belaski, 2001), preference, and findings reported by Horacek & Betts (1998) & Marquis (2005), food features were expected to have a strong influence on healthy eating. But surprisingly, that was not the case. It is likely that other factors may after all play a more important role in influencing healthy diet. HBM has allowed us to understand the comparative influence of various factors.
Recommendations for Social Change Strategies to Promote Healthy Eating Among College Students

A variety of social change campaigns could be employed to promote healthy eating among university students. Since the HBM revealed a few important differences by gender, males and females deserve tailored campaigns. For females, the campaign should highlight the severity of not eating a healthy diet, while the one targeting males should focus on increasing their perceptions of susceptibility. To achieve these objectives, an education campaign would be an important tool to employ. In terms of appeals, a combination of fear (highlighting negative consequences among women and susceptibility among men) and efficacy could be appropriate. A combination of fear and solution approach has been shown to be effective (Witte, 1992).

Use of food labels, another form of communication-only tool, does influence dietary habits, but in a conditional manner. According to Kristal et al. (2001), individuals who use labels report reductions in fat intake but not an increase in fruits and vegetables simply because one can read nutritional facts of processed foods but not fruits and vegetables. When used as point-of-purchase (POP) messages, labels have shown less effectiveness among students, especially when competing with more attractive commercial messages in the university cafeteria (Mayer, Dubbert, & Elder, 1989). POP interventions have been used in the past to promote a healthy diet, but with mixed results (Buscher, Martin, & Crocker, 2001). POP interventions increased yogurt, pretzel, and whole fruit sales but had no effect on fruit basket and vegetable basket sales. According to the authors, effective POP displays emphasize budget friendliness, sensory/taste, convenience, and energizing properties of food. Placement of POPs is also critical. The researchers found that POP messages placed at the entrance of the food-service facility were more effective than keeping them near the healthy food items. POPs can also be used as reminders to ensure sustainability of interventions (Maddux, 1993).

Successful attempts have been made to influence healthy eating when offered in the form of a nutrition course (Matvienko, Lewis, & Schafer, 2001). But in many cases, awareness creation by itself may not be an effective technique (Brown, Dresen, & Eggett, 2005; Schnoll & Zimmerman, 2001), especially while addressing the influence of efficacy to eat healthy. For example, a study conducted by Schnoll & Zimmerman (2001) incorporated the self-regulation strategies of goal-setting and self-monitoring in a nutrition course. Goal-setting by itself and in combination with self-monitoring had a positive impact on self-efficacy to consume and consumption of dietary fiber. In other campaigns, when promotion (that is newsletters and e-mails) was combined with motivational interviews, the campaign seemed to have a positive impact on fruit and vegetable consumption among college students (Richards, Kattelmann, & Ren, 2006). Additionally, while reaching women,
studies have shown the effectiveness of a counseling approach (Leslie & St. Pierre, 1999).

To address the influence of barriers and efficacy by promoting tasty but healthy food with convenience on and off campus, employing the social marketing approach could be effective. Social marketing applies marketing principles to encourage voluntary behavior change, and a key element of social marketing is to offer attractive alternatives in the environment. Since barriers influenced behavior intention among females, a survey identifying those barriers should be conducted followed by employing a social marketing campaign that would reduce these barriers by altering the environmental factors on the campus. These efforts will hopefully also increase efficacy among female students. For males, a social marketing campaign would also be desirable but the focus ought to be explicitly on increasing efficacy.

We found very few attempts that used a social marketing approach to promote healthy diet behavior among college students. Buscher et al. (2001) was one of them. They tested the effectiveness of product and place intervention (ensuring easy availability of vegetables, fruits, pretzels, and yogurt) along with promotional POP messages in the cafeteria. As discussed earlier, the study found that sales of yogurt, pretzels, and whole fruit increased as a result of the intervention. We commend the Buscher et al. study because they considered promotion of products, a variety of products, products that are desirable and those that compete with junk food options. The intervention also ensured availability of intervention products, promotional tools that emphasized positive qualities of products rather than focusing on creating fear, and in general a strong consumer orientation. This may have resulted in a successful intervention.

Previous studies have recommended the use of prepaid meal plan (Brown et al., 2005) and seeking cooperation of food service administrators (Leslie & St. Pierre, 1999) especially for on-campus food offerings. Buscher et al. (2001) has also recommended dieticians to work with food service administrators for better offering of meals on campus. Availability of healthy food will reduce the perception of barriers of eating a healthy diet. According to Marquis (2005), convenience has two dimensions, time and energy, in preparing healthy food. Both these dimensions may warrant differing strategies among college students. Strategies such as meal sharing and meal preparation sharing as suggested by Sobal & Nelson (2003) could address these barriers.

A meal plan intervention study (Beth Brown et al., 2005) influenced students’ intake of food groups. Participants reported more favorable intake of vegetables, fruits, and meat. This study also revealed significant interaction of meal plan participation with gender. Males more favorably responded to the meal plan than females in relation to intake of meat and vegetables. Other features such as attractive packaging and branding of healthy food to deal with similar strategies utilized by the competitors would be critical (Belaski, 2001).
Tailored education campaigns should use student input in order to be effective (Cousineau, Goldstein, & Franko, 2004), use computer and Internet technology (Cousineau et al., 2004; Hanauer, Dibble, Fortin, & Col, 2004) and peer networks (Kessler, Gilham, & Vickers, 1992) to reach the intended audience. Ohio State University, for example, has utilized the Internet to provide nutritional information about food on campus (Belaski, 2001). While addressing students, use of appropriate media (mass as well as non-mass media options) and the messenger should be borne in mind since external cues played an important role in our HBM model.

LIMITATIONS AND FUTURE RESEARCH

The main limitation of this study is that the experimental manipulation may have influenced students’ perceptions and heightened the importance of eating healthy. However, the relationship of the control variable (experimental manipulation) was significant with very few variables among all three samples, reducing the concern of this extraneous variable. Second, this study was conducted only on one campus, using convenience sample, and within one culture. Testing the influence of these factors on other campuses and a more representative sample would increase the generalizability of the study. Nutrition habits and predictors may vary by geographical location and this could influence the tendency to eat healthy. Third, our dependent variable on intention to eat healthy was asked at a global level. This may have prevented us from understanding the predictors unique to each food group. Studies for example by Brown et al. (2005) showed how a prepaid meal plan had a differential effect on each food group.

The moderate to high averages of many variables could be a result of social desirability, nevertheless many of these results are consistent with other studies. The zero-order correlation score of likelihood to eat healthy with a few variables such as barriers and benefits are much higher than their standard regression weights. This could be because there is a third variable moderating the influence. Future research could be conducted to investigate this. Finally, in relation to factor analysis, two limitations are noted. First, the alpha level for cues to action and food features were under the .70 ceiling typically regarded as the minimum acceptable level. Second, importance of eating healthy, and perceived susceptibility, scales were formed on the basis of one or two items. Future studies should investigate these constructs with multiple items to provide higher reliability.

The Kristal et al. (2001) study conducted among an adult population showed that stage of change was one of the strongest predictors of decreased fat intake. Individuals in the maintenance stage were highly likely to change their diet. Richards et al. (2006) study showed favorable influence of tailoring messages by stages of change of students on their consumption of fruits and
vegetables. It might be worthwhile to understand the predictors using HBM at various stages. This would also enable campaign managers to better tailor their campaigns appropriately.

As a follow up study, it would be useful to compare the influence of each social change strategy (education only, education combined with counseling, and social marketing) in influencing students’ healthy eating habits. This will enable campaign managers to effectively appropriate funds. Two surprising results were that food features failed to influence barriers and, secondly benefits failed to influence behavior intention. Future studies should investigate the nature of these relationships, or lack thereof. Since efficacy played an important role in influencing the behavior intention and showed a significant relationship with the barrier variable, future studies should investigate the role of two types of efficacy as discussed by Witte (1992): self-efficacy and response-efficacy.

REFERENCES


